



A Safe, Maintenance-Free Approach to the Unblocking of Pipelines Across the DOE Complex

Technology Need:

The U.S. Department of Energy (DOE) needs safe and efficient technologies for radioactive tank waste retrieval, immobilization, and disposal activities. As tank clean-out and decommissioning activities begin at DOE sites, the possibility increases for high-level radioactive waste transfer lines becoming plugged and unable to transport waste. Whereas some sites, such as Savannah River, Hanford, and Oak Ridge, experienced blocked lines in the past, plugging may recur at these sites at the onset of waste transfer. Plugged pipelines represent a considerable hazard as well as a loss of time and money.

Technology Description:

A contract was awarded to AEA Technology Engineering Services (AEAT) to design and build a power fluidics pump system, using water as the fluid, that can be used to locate a blockage in a pipe system, and then unblock it by dissolving the blockage or by mechanically eroding the blockage. AEAT's technology is based on a fluid erosive wave-action principle, which operates much like ocean wave-action on beach erosion. The system consists of a water tank, pressurized vessel, fluidic control unit, vacuum pump, and a jet pump.

First, a vacuum pump and/or a jet pump are used to evacuate any air that may be present in the pipeline. Once a vacuum has been established, a ball valve is opened and water is allowed to fill the pipeline. The fluidic control system is then used to provide drive and suction cycles to the fluid. The drive cycle forces the water against the blockage and the suction cycle aids the water's retreat from the blockage. These cycles are repeated many times until the blockage is eroded away. The frequency and duration,

as well as the pressure, of each cycle can be controlled via the fluidic control unit.

Benefits:

- <Short mobilization and demobilization time
- <Can be used to deliver chemical solution to the blockage
- <System works under very low pressures
- <Technology can negotiate many elbows
- <Technology can be operated remotely
- <No water is discharged until the blockage is cleared

Status and Accomplishments:

This project was concluded October 2000. AEAT completed field testing of their power fluidics pumping system, constructed as a portable test rig, on a large-scale test bed at the Florida International University (FIU). A total of 6 blockages ranging from 4 ft to 8 ft sections of Bentonite-sand (30wt%-30wt%), Kaolin clay-Sand (40wt%-40wt%) and K-Mag-water (90wt%-10wt%) were tested along a 255 ft section on Test Bed (TB) # 2. Also a total of 6 blockages ranging from 4ft to 12ft section of Bentonite-sand, Kaolin clay-sand, and K-Mag were tested on TB #2 (1765 ft long).

The AEAT system was also modified to connect to a 1" diameter PVC pipeline that was constructed along TB #2, however, the demonstration performed on the 1" pipeline showed blockage location was difficult to quantify, and reaching the blockage at the dead end of the 255 ft section

was not feasible with the current AEA technology system. During the trials using the entire length of TB #2, it was found that water reached the blockage at a much slower pace after the vacuum phase, and that the air pockets along the pipeline had to seep through the blockage in order to create an erosive action. The technology was unaffected by elbows in the pipeline, and the setup did not discharge water until the blockage was cleared.

The National Energy Technology Laboratory Internet address is <http://www.netl.doe.gov>

AEAT Equipment Setup



Contacts:

Peter Griffiths
AEA Technology Engineering Services Inc
Phone: (704) 799-2707
E-mail: peter.griffiths@aeatech.com

George T. Bellas
National Energy Technology Laboratory
Phone: (412) 386-6184
E-mail: george.bellas@netl.doe.gov

Online Resources:

Office of Science and Technology, Technology Management System (TMS), Tech ID # 3115
<http://ost.em.doe.gov/tms>

